

Precision Application Technology Pinpoints Turf Economics



The art of maintaining quality turf has seen much technical advancement both in sprayer equipment and the products applied through those machines. As soon as advancements improve the quality of the turf, our expectations are almost immediately raised for better technology and improved practices.

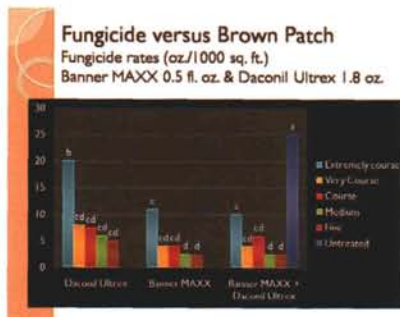


Fig 2.

The research above suggests that the smaller the droplet size the better the performance of the products tested. M. Agnew 2006



Figure 3.
Droplets from XR nozzle

Application technology has followed and has, to some degree, pushed the “expectation” curve at an accelerated pace. For example, application of turf chemicals evolved from a basic liquid application using a ground driven pump and a single broadcast nozzle to the quality, high performance pumps and nozzle selection available today to meet the range of pressure, volume, and droplet size specifications. Further developments have delivered pressure and flow based rate controllers that can hold a constant application rate dependent on the speed of the application unit or the number of sections that are functional at any particular time during the application. Similar advancements evolved with dry material spreaders. Gravity fed drop spreaders (which still meet specific application needs today) progressed to a wide swath spinner spreader that provided accurate application of granular material product. There is also technology that uses air flow placement of product.

Ensuring the preservation of the environment and meeting to the high expectations for today’s playing conditions is a continuing challenge. We are fortunate in this industry to have individuals and companies that have dedicated their research efforts to this agenda. Much of the information on application technology was presented at the winter meetings and provides a valuable review of the work that was originally completed by Dr. Couch in the early 1980s. Generally speaking, higher water volumes will solve many of the performance issues on fairways, but time and production are the compromising factors in today’s management environment, therefore 1-1.25 gal/m² is a common application volume for fairways. A recent summit of leading turf researchers and industry professionals, organized by Dr. Mike Agnew of Syngenta, presented current research on improving fungicide performance through application timing and technology. According to Agnew, “The purpose of the research was to find out how to make 1-1.25 gal/m² of solution perform in fairway fungicide programs.” Nozzle technology has changed and

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the research suggests that improvements extending product performance in fairway applications can be achieved.

The research mentioned above has been driven by chemical companies and nozzle manufacturers but more work needs to be done. We can expect to be under continuing scrutiny both from our clients and from government regulators. The GCSAA initiative of Best Management Practices (BMP) is a resource tool for superintendents as they plan out their operations or look to improve current practices. On the GCSAA website under the category of Resources—Environmental Desk Reference there is a section titled “Pesticide and Herbicide Use,” which included this excerpt from the FQPA regulation.

“Practical knowledge of pesticide problems associated with the production and maintenance of ornamental trees, shrubs, plantings, and turf, including cognizance of potential phy-

toxicity due to a wide variety of plant material, drift, and persistence beyond the extended period of pest control. Because of the frequent proximity of human habitations to application activities, applicators in this category must demonstrate practical knowledge of application methods which will minimize or prevent hazards to humans, pets, and other domestic animals.” 40 C.F.R. § 171.4(c)(3).

Dan Dinelli of North Shore CC had this to say about spray technology and BMP:

“As an industry and practitioner, its important we continue to improve on our use of inputs and maximize any needed plant health care applications. Great advances has occurred in formulations, chemistry and application methods to help safe guard the environment as well as improve efficacy. Many considerations are given each time a treatment is made. Justification of treatments as well as product selection, ensuring compatibility with the environmental conditions of the site is important. Fortunately, we have great resources available through the Chicago District Golf Associations Turf Program “Interactive Turf” to help with diagnostics and recommended treatments. Decisions on timing, tank mixes, additives, carrier (both quality and quantity is considered when water is used) and equipment selection are important. “One size fits all” does not work when optimizing various treatments. For example, we elect to use covered spray booms outfitted with high-pressure flat fan nozzles. This arrangement minimizes the risk of drift, ensuring product is applied on the targeted area of need. The high-pressure flat fan nozzle delivers a fine spray with great disturbance, allowing for thorough coverage of the foliage deep into the canopy. We feel this is a great tool when delivering foliar applied products. However, when soil applications is targeted, a more course droplet is better requiring a different nozzle selection as well as amount of carrier added in the mix. If “watering in” is necessary, handheld radio control devices work well applying irrigation soon after treatment, before the product dries on the foliage. Applying treatments is

a detailed systematic practice requiring much thought and selection from the many options that exist. However, the basic BMP’s in storage, disposal of waste and handling of product is equally important.”

So what is the potential for application technology in helping the superintendent meet the limits of regulation and the expectations of a demanding clientele? One of the next major advancements of sprayer technology is in the assurance of accurate application through advanced sprayer controls, valve section controls, and perhaps most recognizably through GPS guidance technology.

In the early 1990s GPS was introduced into the agricultural market for mapping and variable rate fertilizer applications. Initially, the technology was expensive and complicated. As better satellite technology evolved and a more intuitive format was designed, GPS products began to become more accepted. After its acceptance in agriculture, GPS became a reliable site mapping feature for irrigation and other maintenance functions. Then GPS entered the Pro Shop as a real-time mapping program for player assistance in golf carts. Even then, GPS was considered a “Star Wars” concept to most application professionals in the turf business. The use of the technology in sprayers and spreaders just did not seem to have the right payoff for maintenance operations. During the last three years, the reliability and the familiarity of GPS systems has grown at a rapid pace and been incorporated into dynamic products that affect our everyday life. GPS in our cars and cell phones are prime examples. The time has come for this technology to integrate into sprayer and spreader applications as the precision and accuracy of GPS now meets the expectations of today’s superintendent.

After several years of proven acceptance in the agricultural markets, component GPS product application systems are now available for turf. Two new application features of GPS are **Automatic Boom Section Control (ABSC)** and real-time mapping. Both deliver additional value for the professional applicator. The system works through a simple adaptation of



Fig 4. Utilizing GPS technology, sections of the sprayer apply product only to desired target area.

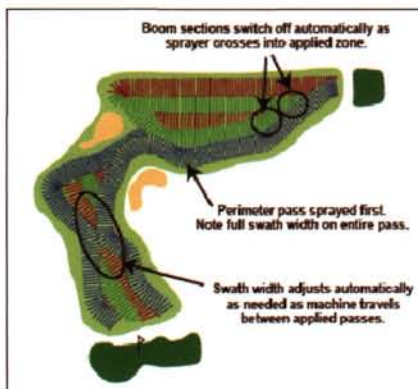


Fig 5. Real time mapping adds additional value as a management tool.

current rate controllers to a GPS directed switch box. The switchbox automatically controls the boom section valves in accordance with GPS program memory, which recognizes previously applied areas of the fairway. The application works with real-time mapping so there is no need to have your course previously mapped. Most sprayers come with three section valves to control the left, center, and right section of the boom. Those three existing sections can be easily adapted for ABSC. Just to clarify, a rate control is needed to make the adaptation. This controller will compensate the system pressure as the sections are turned off and on during the application process. Data points from the application are recorded every one-to-three seconds and register the "swath" applied. The swath stored in the GPS component's memory corresponds to the previously applied area. The component will also recognize, in memory, the sections that are open at the time of application. The GPS system can also be linked with a mapping tool that will

provide an electronic file of the application and a real time visual of the application on an LCD display. The display can then be referenced by the application technician or the superintendent to verify the accuracy of the application and make decisions on how to manage areas that may have been "skipped" in the process. The accuracy of the system utilizing the free WAAS satellite signal is commonly referred to as 6" pass-to-pass accuracy. As the sprayer unit enters a previously applied area, the program memory recognizes the area and shuts off only those sections that cover the previously applied area.

A five section manifold can be adapted to the sprayer and give the applicator a greater degree of accuracy when combined with a GPS ABSC product. With five section control valves, the standard 18' boom can be divided into two left side sections, two right side sections, and a center section.

An initial study by Dr Tom Fer- manian performed at Linconshire Fields CC, Fairway #17 tested a Tee-

Jet Technologies, Swath Manager 5, Automatic Boom Section control device and determined the technology to be 99.2% accurate as compared to the target rate.

The 2007 season promises to be the proof of concept year with more studies and demonstrations planned. Application accuracy, target rate efficiency, reduction of applicator stress, record keeping, and input savings are the key features of GPS automatic boom section control. All can contribute to quality application performance. This technology appears promising with further advancements. Stay tuned for more information in 2007 as further research in golf turf is conducted.



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